Periscope.

a.—ANATOMY AND PHYSIOLOGY OF THE NERVOUS SYSTEM.

TACTILE HAIRS.—The following is an abstract of a paper on "Tactile Hairs," by Dr. Lester Curtis, before the Illinois State Microscopical Society, and for the report of which we are indebted to the courtesy of the Secretary, Mr. Ernest Stuart.

"The tactile hairs, commonly called whiskers, are peculiar to carnivorous animals. The growth of an ordinary hair takes place by the multiplication of the cells which surround the papilla, and the follicle possesses no muscles of volition or special arrangement of nerve fibres.

"The first noticeable peculiarity of the tactile hair, as in the snout of a mouse, is the great size of the follicle—several times that of an ordinary hair follicle; this follicle has a bulging, about one-third of the distance from the top, which corresponds with a remarkable enlargement within.

"Two-thirds of the lower portion of the follicle is surrounded by striated muscular fibres, which appear to arise from the side of the follicle by a short tendon encircling it, and these pass off to a considerable distance, to become lost in the muscular fibres of the lip. These muscles are furnished with a rich plexus of unusually large capillaries. Other muscles are attached to the hair in a manner somewhat similar to the ordinary erectors of the hair, but are more abundant and of the striated variety.

"Within the follicle and outside the root-sheath of the hair, is a close plexus of very fine capillaries, which send branches over the enlargement mentioned above, and form a peculiar ring-like plexus above it. Between the branches of this ring-like plexus, there is but little tissue; but in the mouse and cat, at least, it does not form a sinus, as is claimed by some.

"The enlargement surrounds the hair excentrically, and consists of two parts, the outer of which, when the follicle is divided longitudinally through the centre of the hair, is nearly circular in outline, and is attached to the outer part by a short, thick pedicle. It is interspersed with oblong nuclei. The inner part is not so wide, but is longer, and surrounds the root-sheath like a band."

The speaker considered these last organs to be of a nature similar to the terminal organs of nerves found in other portions of the body; but was not prepared at present to prove his position.

The paper closed with a brief bibliography of the subject, after which numerous slides were shown, in illustration of the organs described.

THE INNERVATION OF THE UTERUS.—In a long paper in *Virchow's Archiv* (Bd. 76, Heft I., p. 1), Prof. A. Röhrig describes his researches on this subject, being partly a confirmation of previous statements, partly new additions.

As the best animal for the purpose, the author used virgin rabbits, the uterus of which responds readily to stimuli, but does not show spontaneous movements. The animals were poisoned with a dose of curare, just sufficient to necessitate artificial respiration.

On irritating various parts of the nervous system, by insertion of needles connected with an induction coil, it was found that movements of the uterus could be obtained by stimulation of almost any part of the brain or cord. The movements were, however, more energetic from stimulation of the lower parts of the cord than from the upper portion or brain. Irritation of the lumbar cord produced the most intense tetanic uterine contractions.

All motor nerves of the uterus originate in the cord below the *tenth* dorsal vertebra. Irritation of the spinal segment above this height is of no influence; while below this point the cord, if irritated, induces violent contractions. Irritation of nerve centres is very conveniently effected by supplying them with venous blood. On ceasing the artificial respiration in the curarized animal, the cord of which was severed at the level of the tenth dorsal vertebra, violent uterine contractions of the uterus were seen. These contractions continued often for the space of one hour after the death of the asphyxiated animal. This result can explain the occasional occurrence of a post-mortem parturition in pregnant human females. It may be supposed, however, that the venous blood can cause these movements by irritation of the uterus itself. In order to decide this matter, Röhrig destroyed the lumbar cord, by inserting a hot wire into the spinal canal. After this destruction no further uterine contractions could be induced by asphyxia, although the uterus still responded to direct electric stimulation.

Similar uterine movements follow the sudden checking of the blood supply by compression of the aorta. These also depend on an irritation, and hence the integrity of the lumbar portion of the spinal cord.

Uterine movements can also be brought about by injection of certain poisons into the veins. These are the various spinal stimulants, which either stimulate directly, or, at least, exaggerate immensely the reflex excitability of the cord. Their influence on the uterus ceases, of course, on destruction of the lumbar cord. Strychnia and picrotoxin are the most powerful agents; nicotine and carbolic acid act only in larger doses. The latter requires a quantity of 0.20 grm. injected into the jugular vein. Caffein acts similarly; but its effects cannot be demonstrated on a virgin uterus; it requires an organ more irritable by previous impregnation.

The promptest action can be attributed to ammonia. An injection into the vein of 5 to 8 ccm. of a two-per-cent. solution, causes an immediate powerful tetanic contraction, which lasts, with short intervals of rest, for an hour or more, changing hereupon to peristaltic movements. If the animal is killed by an overdose of ammonia, the contractions can continue for an hour after death. But ammonia differs from the other agents in stimulating the uterus itself, or, at least, its intrinsic nerves, since the contractions caused by ammonia are *not* avoided by destruction of the cord. It had been known previously that the agent is a powerful stimulant to striated muscles, but this result shows that it calls into activity unstriated muscles as well. The action is produced also by the salts of ammonium, the chloride and carbonate.

Stimulation of the uterus centre is also produced by calabar bean and ergotin. The latter, however (extr. secal. cornut. aquos. Pharm. Germ.), does not act when injected under the skin, since it is not sufficiently absorbed. The movements thus produced are not as violent as those from the previous poisons; they are not tetanic in character, but peristaltic, and persist much longer than the more violent tetanus of strychnia.

The study of the influence of chloroform on the reflex activity of the uterus, was hindered by the difficulty of chloroforming rabbits without killing them. It could, however, be observed that the influence on the uterus is about the same as that of hydrate of chloral, an agent much safer of application.

The narcosis retards immensely the occurrence of reflex contractions of the uterus. They occur not only later, but are also feebler, while the uterine centre is readily exhausted. Morphine and opium do not possess this paralyzing influence. Atropin, on the other hand, reduces considerably the excitability of both uterus and uterus centre.

The supposed action of various purgatives, and so-called *abortifacients*, has never been properly studied. An intravenous injection of aqueous extract of aloes or colocynth causes, within ten to fifteen minutes, peristaltic movements of the bowels, often finishing with defecation. Some three to five minutes later feeble, creeping constrictions are noticeable at the cornua of the uterus; but they do not develop into proper peristaltic contractions. A more powerful action is, however, exerted by extr. sabinæ. The injection of 1 grm. of extract of savin caused, within two to three minutes, strong tetanic contractions, which changed gradually into peristaltic movements, continuing sometimes for two hours. This agent acts through stimulation of the cord; destruction of the latter removes its influence. The effect, however, on the uterus was such, that Röhrig recommends highly its experimental trial in obstetrics.

The uterus centre is finally very susceptible to reflex excitation, uterine tetanus being the immediate result of any irritation of sensory nerves. This can even be produced by irritation of the skin by cold or heat.

Searching the course of the motor nerves of the uterus, Röhrig examined, in the first place, the pneumogastric and dorsal sympathetic nerves. Both possessed no influence whatsoever on the movements of the uterus. The positive results, on the other hand, can be stated in the author's own words:

1. Section of either the nervi uterini (sympathetic) or the sacral branches, causes a momentary peristaltic contraction.

2. Electric irritation of the cord (or asphyxia) causes, after section of the uterine nerves, a feeble peristaltic contraction. The same is produced by reflex excitations.

3. The same excitations act, however, more powerfully if the sacral branches have been divided, instead of the uterine nerves.

4. Section of both sets of nerves cuts off the uterus entirely from the influence of the cord.

5. Feeble electric irritation of the peripheral ends of the divided uterine nerves, causes tetanus of the organ;

6. While a weaker contraction is induced by stimulating the sacral branches.

7. Sensory fibres are found in both sets of nerves.

Examining the nerves of the ovary, Röhrig found them to contain only centripetal fibres. Irritation of the peripheral end of the divided nerves produced no visible symptom; but irritation of the central end, or of the ovary itself, does not cause any pain whatever. The centripetal nature of these fibres reveals itself only by a rise in blood-pressure. H. G.

FUNCTIONS OF THE BRAIN.—A. Musehold, at the instigation of Prof. Leyden, publishes a memoir (Berlin, 1878, Abstr. in *Cbl. f. med. Wissensch.*, No. 14) on the result of partial extirpation of the cerebrum in pigeons. The operation was performed in part after the method of Goltz by washing out parts of the brain substance by a stream of water, and in part of the cases by simple removal of the cerebral tissue with a sharpened ear spoon. Simpler results followed the experiments performed by the last named method, especially was the generally observed weakness of the extremity of the opposite side wanting in the first series. If, in the second series, the loss of brain substance was in the anterior portion of the hemisphere, no results of the extirpation could be demonstrated, while disturbances of sight on the opposite side, regularly followed the abstraction of larger or smaller portions of the posterior half. The disturbance of vision was evidenced by the fearlessness of the animal, when objects that before frightened it were brought near the affected side, in its inability after the darkening of the eye that still possessed its power intact, to pick up or recognize its food, and in its disinclination to fly, or to stop when once aroused to flight. The visual disorder was the less in proportion as the quantity extirpated was small, but in all cases, recovery occurred sooner or later, though to be sure it was never the case that the whole posterior hemisphere was removed. If, after recovery, a considerable portion of the posterior hemisphere of the other side was also removed, there did not follow disorder of vision on both sides, as would be expected if the restoration of sight was due to vicarious action of one hemisphere for both, but there was again unilateral (crossed) visual disturbance. Hence it was concluded that, after partial extirpation, the parts surrounding the portion of brain substance removed from the posterior hemisphere could learn the functions of the portion lost.

THE DEVELOPMENT OF THE BRAIN AFTER BIRTH.—At the session of the Societé de Biologie, Paris, Mar. 30 (rep. in *Gaz. des Hopitaux*), M. Parrot made a communication on this subject. It results from his researches, that the brain of the new-born is a very imperfect organ developing itself in a very slow manner. Without wishing to follow the development in all its phases,

M. Parrot spoke only of that in the first year of life after birth. He would not give attention to the general morphology nor to the chemical or histological changes occurring during this first year, but would only notice what could be observed with the naked eye.

He had made ninety-six autopsies of infants at periods between birth and the close of the first year, but principally on those between two days and four months of age. Those infants of whom he had not the real age were left aside. He divided his study into several parts, a first series including infants from one to fifteen days old, and the others passing from month to month. The following is his method of procedure: he places the cerebral hemisphere on a table on its internal face, and makes sections parallel to that face, beginning only four or five millimetres from it, and the others two to three millimetres apart.

This study is grounded on two orders of considerations, the topographical and the chromological. The following are the general results. In a topographical point of view, when any portion of the nucleus presented any quality whatever, that part which is above it exhibits inferior qualities. In a chromological point of view, there exists a constant relation between the colors of the various parts at the same age.

Taking for a centre the system of Rolando, in which appears the white substance, we may say that this system divides the brain into two absolutely different regions, anterior and posterior, the former developing more slowly than the latter. We may conclude from this, that the development of the white substance is correlative with the grey. M. Parrot observed, besides, that the precocity of development of the occipital region is in relation to the precocity of the bony sutures of that region. After having investigated the relations that exist in the development of the two hemispheres, M. Parrot says that in four-fifths of the cases it is more pronounced in the right than in the left. He observed also, that the cerebellum is much more rapidly developed than the cerebrum. In the brain, therefore, it is the cerebrum that is last developed and its anterior portion more slowly than its posterior. These results seem to be in accordance with the views now generally accepted as to the functional importance of the frontal lobes.

In reply to an objection of M. Luys that he had not taken enough into account the respective weights of the two hemispheres, the left being the heaviest, M. Parrot said that he used this test much, but could not infer that the heavier of the two hemispheres, if there was any difference, was the most developed, but rather the contrary.

THE TONUS OF STRIATED MUSCLES.—Dr. S. Tschirjew (*Archiv f. Anat. und Physiologie*, 1879, Hft. I. & II., p. 78) precedes his experiments on this subject with a resumé of his previous researches on the tendon-reflex. He had found that the muscles are connected with the cord not only by motor but also by centripetal fibres, following the usual course of sensory filaments. These centripetal fibres are the afferent route of the tendon-reflex. Histologically, Tschirjew has observed a rich net-work of nerves in the muscular aponeuroses. Since no sensory fibres can be found in the muscles, the author concludes that the nerves ending in the aponeuroses are the only centripetal fibres of muscles and not specifically sensory nerves.

Since the tendon-reflex is caused by the sudden stretching of these nerves, the question arises, whether their continuous tension can maintain the muscular tonus. In order to decide this point, a rabbit was narcotized with morphia and its crural nerve isolated. Great care is needed to avoid injuring the nerve, since the aponeurotic nerves are very easily rendered inactive. The experiment was only continued if the tendon-reflex could still be produced after the isolation of the crural nerve. The leg was now firmly attached to the board and the patellar tendon severed from the tibia and connected with the lever of a myographion to which different weights could be attached.

After this mode of preparation, the myographic record showed distinctly that division of the crural nerve is followed by a lengthening of the muscle, in other words, that the stretched muscle is in a state of tonic contraction as long as its nerve is uninjured. The extent of lengthening after nerve section depends on the weight stretching the muscle. Beyond a certain state of tension the muscle will no longer lengthen.

As an incidental but significant observation Tschirjew mentions in this place the difference in the myographic curve of this muscle preparation, when irritated by a single induction shock before and after division of the nerve. The muscle severed from the cord, contracts and then relaxes suddenly, performing several elastic oscillations after its relaxation. If, however, the muscle is still connected through its nerve with the spinal cord, the relaxation after a momentary contraction is gradual, and elastic oscillations occur. The muscle is evidently in a tonic state during its gradual relaxation.

The existence of a constant tonus from central innervation can be no longer defended. It can readily be observed, that the muscles when not stretched are completely relaxed. Tschirjew's results show, however, that when the muscles are stretched they undergo a tonic contraction lasting as long as the stretching.

This arrangement is undoubtedly of considerable mechanical importance, since thereby a condition comparable to the dead stop of machinery is avoided, as well as the elastic oscillations which muscles show after severance from the nerve centre. The possibility of a more delicate graduation of voluntary muscular efforts is thus guaranteed.

THE COURSE OF PERIPHERAL NERVE FIBRES.—In embryos of rabbits, 8 centimetres in length, Dr. L. Löwe (*Centralblatt*, No. 19, 1879) claims to have demonstrated a visible difference between sensory and motor nerves. The embryos were stained by immersion in ordinary carmine, whereupon the motor nerves assume a *darker* coloration than the sensory fibres. This deeper hue of motor nerves depends on a more thorough imbibition of their substance with carmine and on the presence of round cells in their substance. As yet, Löwe has not been able to determine, whether this difference is due only to a more advanced state of development of one or the other set of nerves, or whether it indicates a structural difference.

On account of the different coloration it can be readily seen, that in the case of spinal nerves the sensory root is lighter in color in front of the spinal ganglion, than after it has passed through the same. In the mixed trunk the sensory bundles are always found on the external side of the motor fibres, except in the posterior branches of the spinal nerves, where this relationship is reversed. According to its coloration the nervous twig passing to the nearest sympathetic ganglion seems to consist purely of sensory fibres.

THE SINEW-REFLEX.—Prof. Berger, of Breslau, publishes in the *Central-blatt f. Nervenheilkunde*, No. 4, Feb. 15, the results of his investigations on the tendon-reflex. While his observations in the main agreed with the statements of Westphal and Erb that this reflex is lacking in ataxia, he yet found two well marked cases that were exceptions to this rule, out of eighty-two examined, or 2.4 per cent. In this number, moreover, he excludes all cases not absolutely uncomplicated, especially rejecting those in which the lateral columns were involved. Moreover, there were in the eighty-two, four cases in which the patellar reflex was lacking only on one side (3 times left, 1 right) without any mentionable difference in the way the two limbs were involved in the other symptoms. In one of these cases the foot phenomenon was markedly present on both sides, and in another, only a few weeks before, the presence of the patellar reflex on both sides was demonstrated.

In order to test the question of the presence or absence in healthy individuals, he, with the assistance of Drs. Köbner and Kroner, examined over fourteen hundred healthy persons, among them nine hundred soldiers. The results are stated as follows:

1. The intensity of the patellar sinew-reflex varies within very wide limits in healthy persons. In very many cases it is so slightly developed that it is only with special care that it can be called out. Thus, numerous cases were brought in which it was said to be lacking, but in whom it was finally observed. On the other hand, in very many cases it is remarkably developed, so that only a slight tap with the finger will call forth a powerful contraction, and not infrequently a series of rapidly succeeding flexion and extension movements. Here, we were able to demonstrate, by Erb and Westphal's method, the clonic form of the patellar reflex. It does not appear positively allowable, from the facts, to speak of a pathological increase or diminution of the patellar sinew-reflex. Only the absolute absence of this (with certain exceptions) and the evidence of an exalted sinew-reflex in various other muscles in which, under normal circumstances, the contractions are neither regular nor very marked, justifies the conclusion of an abnormal condition.

2. The patellar sinew-reflex was lacking in twenty-two healthy individuals, lor in 1.56 per cent. On account of the clinical significance, I will not negoct to especially state that we examined these twenty-two individuals—not

merely once, but many times—and with all possible precautions. At no time was even a trace of the phenomenon detected. Of course they were further examined in all possible directions: they appeared perfectly healthy (thirteen of them being active soldiers); there was no local anomaly in the knees; the electric contractility of their quadriceps (this only tested in a part) was perfectly normal. This result was so unexpected by me, since I had for years examined healthy persons, and always found this reflex present, and it was so constant during repeated examinations that it seems, contrary to the hitherto accepted notion, that it may be wanting in perfectly sound persons. A unilateral absence of this reflex in healthy persons has not yet been met with by me.

3. Of all the other sinew-reflexes, that from the tendo Achillis is by far the one most easily demonstrated; nevertheless, we found it lacking in twenty per cent. of the cases, and frequently existing unilaterally. On the other hand, the "*foot phenomenon*" (the characteristic reflex clonus of the foot) was only very exceptionally present in healthy individuals. I have met with this in only three young men, but in a very marked manner, and one of these had formerly suffered from convulsive tic. All three were not at all astonished at the very pronounced phenomenon; it had been familiar to them from childhood, that if they sat with the heel raised and only the toe of the foot touching the floor, there would be a tremor of the limb. The adductor reflex, and that from the tendons of the triceps and biceps brachii, have been investigated by us in only a limited number of cases (445 times in 364 persons), and we found the former present in only five per cent.'(two times only unilateral, and once bilateral contraction from unilateral excitation), while the latter could not be demonstrated in thirty-five of the persons examined, or in twenty-five per cent. Besides these, I have examined many other tendons in healthy individuals without yet having ascertained definitely the proportion of their occurrence. Therefore the patellar sinew-reflex, and perhaps also the Achilles tendon-reflex, are to be principally looked for in testing the tendon-reflexes.

4. Of the various detailed results, I will only mention that we saw several times a contraction of the quadriceps follow mechanical irritation of the adductors, and, once, contraction of the adductors from percussion of the patellar tendon of the opposite side. I had previously found and described a similar condition in hemiplegia.

I have proven the exalting influence of strychnia (subcutaneously) on the quickness of the sinew-reflex, and also the quieting effect of morphine on the same. Westphal, in his latest memoir, has held that the testing of the patellar reflex is of special importance in those cases in which tabes begins with spinal amaurosis, the so-called white atrophy of the nervus opticus. Under certain circumstances the answer to the important question, whether this is an independent disorder or only a prodrome of a developing posterior spinal sclerosis, ought to be made possible by the examination of the patellar reflex.

In my hospital department of the city poor-house there is a woman, twenty-seven years of age, now blind for seven years from optic atrophy, with completely absent patellar and Achilles reflexes. The most careful examination does not reveal a single subjective or objective symptom of spinal disease: the patient moves briskly about, and is active in housework. Since it is well known that tabetic amaurosis may precede all other symptoms for years—Charcot, especially, speaks of cases in which the ataxic symptoms revealed themselves ten years or more after the atrophy— I cannot, therefore, yet assume in the above case, that there is a posterior sclerosis from the absence of the tendon-reflex. This view would have some basis, since this disease may be absolutely without symptoms up to the loss of the tendon-reflex, provided we could in this case consider this absence as pathological. I took occasion, last summer, with the friendly co-operation of the attending physician, Dr. Reichelt, to examine the inmates of the Blind Institute. There were at the time eighty-four inmates—nine from atrophy of the optic nerve. Of these, otherwise healthy, nine individuals, between fourteen and eighteen years, there were *two* in whom the patellar reflex was wanting, while out of the seventy-five others, blind from various eye disorders, it was lacking in only a single case. In this connection, I will say that in three powerful adults suffering from optic nerve atrophy, and affording no symptoms of spinal disorder, the patellar reflex was very marked in two; and in the third, on the contrary, it could not be demonstrated. This rather remarkable proportion may, however, very easily be accidental, and only much larger series of cases will allow a correct judgment. In four cases of diphtheritic ataxia (after previous paralysis of velum palati), with perfect integrity of the cutaneous and muscular sensibility, I found an absolute absence of the patellar reflex, while the cutaneous reflexes were notably present. In a shorter or longer time after recovery, in one case in about four months, the sinew-reflex was generally restored. The disturbances of co-ordination, therefore, of the lower extremities afford no resemblance to those of tabetic ataxia—apart from the Romberg's symptom, observed in all four cases—but are, rather, comparable in many respects with cerebellar ataxia (drunken gait).

With our deficient acquaintance with the anatomical basis of ataxias after acute diseases, I can only say that also in cases of co-ordinatory locomotor disorders, without the characteristics of tabes dorsalis, the patellar tendon-reflex may be wanting. The rapid recovery shows, nevertheless, that we do not here have to do with a degenerative alteration, and therefore the pathological failure of the tendon-reflex by itself does not necessarily indicate a serious tissue alteration of the lumbar cord.

Observations of diphtheritic ataxia have led me to question to what extent, also, lesions of the central nervous system situated outside of the lumbar cord may suppress this tendon-reflex, which lesions, according to the experimental researches of Schultz and Fürbringer and, more recently, Tschirjew, must be in the lumbar cord, and, according to Burkhardt, on the other hand, in the plexus or spinal ganglia. But this I reserve for a future communication. In conclusion I relate an anomalous condition of the patellar tendon-reflex, in a case which I consider as one of Remak's *tabes basalis* (optic muscle paralysis — atrophy of optic nerve producing gradually total blindness, anæsthesia of trigeminus; after some years characteristic spinal symptoms, still no anæsthesia). Here there regularly occurred, from tapping the lig. patellæ, a considerable flexion movement of the hip, knee and foot; sometimes, also, a contraction of the adductors of the thigh, but never of the quadriceps; and the involuntary movement, which could not be suppressed by the patient, was remarkably slow in making its appearance, even two or three seconds. Eulenburg has reported a somewhat similar case.

THE COMMUNICATIONS OF THE VENTRICLES WITH THE SUBARACHNOID SPACES IN THE BRAIN.—The following are the conclusions of a paper by Prof. Marc Seé, *Revue Mensuelle*, April:

1. The cerebral ventricles are in direct connection with the subarachnoid spaces of the encephalon and cord.
2. This communication takes place at all points where the pia mater penetrates into the interior of the encephalon.
3. The foramen of Magendie has not the importance attributed to it by him, and its obliteration, normal in certain species of animals, causes no disorder in the mechanism of the circulation of the cephalo-rachidian fluid.
4. This circulation should not be conceived as that of a fluid mass flowing in full tide from one cavity to another through perfectly free orifices, but rather as a true filtration through the meshes of connective tissues that support the vessels of the choroid plexus and the superior and inferior choroidean curtains.

Among others the following articles have lately been published on the Anatomy and Physiology of the Nervous System:

GOWERS, Note on a Reflex Mechanism in the Fixation of the Eyeballs, *Brain*, April.—LUDWIG and LUCHSINGER, Innervation of the Heart, *Centralbl. f. d. med. Wissensch.*, No. 23.—LEWASCHOW, On the Influence of the Crural Nerve on the Lumen of the Vessels, *St. Petersb. med. Wochenschr.*, No. 16, May 3.—SCHADOW, The Sensibility to Light of the Peripheral Portions of the Retina in Relation to Space and Color Senses, *Pflueger's Archiv*, XIX., x. and xi.—LAUTENBACH, The Physiological Action of Heat, *Jour. of Physiology*, II.—OTT, Physiology of Spinal Cord, *Ibid.*